REMARKS

I. The Rejection over Anazawa et al.

On page 2 of the Office Action, claims 1-3, 6, 8-13 and 30-37 are rejected under 35 U.S.C. § 102(b) as anticipated by Anazawa et al., U.S. Patent No. 5,938,908 A. In formulating this rejection it is contended that Anazawa teaches a lightguide and a surrounding medium with refractive indices selected such that light entering the lightguide is internally reflected within the lightguide to illuminate the conduits. This rejection is respectfully traversed for the reasons that follow.

Claim 1 of the present application requires that the lightguide and its surrounding medium have refractive indices selected such that light entering the lightguide is internally reflected within the lightguide to illuminate the conduits. Referring to Fig. 1A, the refractive index of the lightguide is selected with respect to the surrounding medium to confine light rays from the source within a specific volume inside the lightguide.[1] The optical intensity within this volume is sufficient to illuminate a selected portion of each conduit in the array and cause the analytes in that conduit to fluoresce.[2] Light rays entering the lightguide are internally reflected and remain confined to the lightguide to allow substantially uniform illumination of all the conduits in the array.[3] Internal reflection within the lightguide is achieved by selection of materials with appropriate refractive indices at the beam wavelength for the lightguide, the migration medium and the surrounding medium.[4]

The Anazawa reference teaches that the capillaries should be surrounded by a medium (typically water) to index match with the capillaries and reduce reflection/refraction at the capillary walls.[5] In the embodiment shown in Fig. 4 of Anazawa, the optical cell 5 is merely a container for the water that surrounds the capillaries.[6] Anazawa fails to teach or suggest selecting the shape and materials of the container 5 to control reflection/refraction at the interface between the walls of the container 5 and the surrounding medium (air). Instead, Anazawa seeks

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[1] *See also* page 9, line 23 of the specification.
[2] *Id.*, page 9, lines 25-27.
[3] *See* specification, page 10, lines 22-23.
[4] *Id.*, page 10, lines 23-26.
[5] Anazawa, col. 6, lines 13-27.
[6] *Id.*, col. 7, lines 62-65.

to control the reflection/refraction at the capillary walls, and treats any light rays diverging at that interface as lost. Anazawa fails to teach or suggest that the container 5 can act as a lightguide utilizing total internal reflection to contain the light diverging at the capillary walls and redirect it back into the capillaries to provide more uniform illumination for the capillary array. For this reason, Applicants respectfully submit that subject matter of claim 1 is neither anticipated by nor obvious over Anazawa. Reconsideration and withdrawal of this rejection are respectfully requested.

II. The Rejection over Ishikawa

On page 3 of the Office Action, claims 14 and 16-17 are rejected under 35 U.S.C. § 102 (b) as anticipated by Ishikawa, U.S. Patent No. 5,061,029. As support for this rejection it is noted that Fig. 1(D) of Ishikawa shows an optical waveguide structure including a cover 4, a base 3 and an array of substantially parallel grooves 6. This rejection is respectfully traversed for the reasons that follow.

Claim 14 of the present application requires that the migration medium, the substrate, the cover and the surrounding medium have refractive indices selected such that a lightguide is formed when the cover is placed on the substrate. Light entering the lightguide is totally internally reflected within the lightguide to illuminate the grooves. In contrast, the structure shown in Fig. 1(D) of Ishikawa describes a waveguide array in which each channel is itself a lightguide. In the apparatus described in Ishikawa, the cover and the substrate do not form a lightguide that illuminates the grooves by total internal reflection. For at least this reason, Applicants respectfully submit that the subject matter of claim 14 is neither anticipated by nor obvious over Ishikawa. Reconsideration and withdrawal of the rejection are respectfully requested.

III. The Rejection over Kroy et al.

On pages 3-4 of the Office Action, claims 14-16 are rejected under 35 U.S.C. § 102(b) by Kroy et al., U.S. Patent No. 5,252,294 A. In support of this rejection it is noted that Fig. 3 of the Kroy reference teaches parallel grooves 2 configured to support a migration medium. This rejection is respectfully traversed for the reasons that follow.

The apparatus described in Kroy includes micro-cavities 2, not an array of substantially parallel grooves as required by the present claim 14. In addition, Kroy teaches the use of discrete optical fibers to deliver light to the micro-cavities 2.[7] In contrast, claim 14 requires illumination using total internal reflection within a lightguide that encloses the parallel grooves. For these reasons, Applicants respectfully submit that the subject matter of claim 14 is neither anticipated by nor obvious in view of Kroy. Reconsideration and withdrawal of the rejection are respectfully requested.

IV. The Rejection over Dhadwal et al.

On pages 4-5 of the Office Action, claims 18-19, 24, 28-29, 40 and 42-45 are rejected under 35 U.S.C. § 102(b) as anticipated by Dhadwal et al., U.S. Patent No. 5,790,727 A. Referring to Fig. 9 of Dhadwal, it is contended that this reference teaches a lightguide 88 formed from a substrate 96 with an array of grooves 98. This rejection is respectfully traversed for the reasons that follow.

Claims 18 and 42 require either a substrate or a cover having an array of parallel grooves that, with the corresponding non-grooved portion, forms a lightguide. Light emitted by an external light source is totally internally reflected within the lightguide to illuminate the grooves. In contrast, Dhadwal teaches that the capillaries 98 themselves form a lightguide, but do not teach that the surrounding medium performs a light control function.[8] Instead, the capillary walls perform the light control function in Dhadwal. According to col. 10, lines 5-20 of Dhadwal, the capillary cladding defines a minimal spacing between the illuminated portions of the capillaries (e.g. with cladding removed), but do not function to confine light. For these reasons, Applicants respectfully submit that the subject matter of claims 18 and 42 is neither anticipated by nor obvious over Dhadwal. Reconsideration and withdrawal of the rejections are respectfully requested.

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[7] *See* Kroy, Fig. 9, col. 5, line 55 to col. 6, line 39.
[8] *See* col. 2, lines 14-18 of Dhadwal.

V. The Rejection over Anazawa et al. in view of Mizuno et al.

On page 6 of the Office Action, claim 7 is rejected under 35 U.S.C. § 103(a) as obvious over Anazawa in view of Mizuno, U.S. Patent No. 6,542,691 B2. Mizuno is cited for its disclosure of conduits with a substantially square cross sectional shape, and it is contended that it would be obvious to utilize the square conduits in the apparatus of Anazawa to provide the presently claimed invention. This rejection is respectfully traversed for the reasons that follow.

As noted above in the discussion of Section I, Anazawa fails to teach or suggest a lightguide utilizing internal reflection to uniformly illuminate an array of conduits. Mizuno likewise fails to teach or suggest such a lightguide structure. A skilled artisan relying on these disclosures would not be led to provide a lightguide using internal reflection to illuminate the conduit array. Therefore, the cited references, whether considered alone or in combination, fail to teach or suggest the subject matter of the present claims 1 and 7. Reconsideration and withdrawal of the cited rejection are respectfully requested.

VI. The Rejection over Dhadwal et al. and Anazawa et al.

On pages 6-7 of the Office Action, claim 26 is rejected under 35 U.S.C. § 103(a) as obvious over Dhadwal et al. in view of Anazawa et al. Anazawa is cited for its teaching of fused silica capillaries. This rejection is respectfully traversed for the reasons that follow.

For the reasons discussed above in Sections I and IV, neither Dhadwal nor Anazawa teach the lightguide structure required by claims 1 and 18 of the present application. A skilled artisan, relying on the teachings of these disclosures, would not be led to provide a lightguide utilizing internal reflection to illuminate a capillary array. For at least this reason, Applicants respectfully submit that claim 26 is not obvious over the combined teachings of Dhadwal and Anazawa. Reconsideration and withdrawal of the rejection are respectfully requested.

VII. The Rejection over Dhadwal et al. in view of Ishikawa

On page 7 of the Office Action, claim 27 is rejected under 35 U.S.C. § 103(a) as obvious over Dhadwal et al. in view of Ishikawa. Ishikawa is cited for its teaching of polymer substrates. This rejection is respectfully traversed for the reasons that follow.

For the reasons discussed above in Sections II and IV, neither Dhadwal nor Ishikawa teach the lightguide structure required by claims 1 and 18 of the present application. A skilled artisan, relying on the teachings of these disclosures, would not be led to provide a lightguide utilizing internal reflection to illuminate a capillary array. For at least this reason, Applicants respectfully submit that claim 27 is not obvious over the combined teachings of Dhadwal and Ishikawa. Reconsideration and withdrawal of the rejection are respectfully requested.

VIII. The Rejection over Anazawa et al. in view of Giallorenzi et al.

On page 7 of the Office Action, claim 38 is rejected under 35 U.S.C. § 103(a) as obvious over Anazawa et al. in view of Giallorenzi et al., U.S. Patent No. 3,963,310. Giallorenzi is cited for its teaching of polymethylmethacrylate lightguides. This rejection is respectfully traversed for the reasons that follow.

For the reasons discussed above in Section I, Anazawa fails to teach the lightguide structure required by claims 1 and 30 of the present application. The Giallorenzi reference likewise fails to teach or suggest this lightguide structure. A skilled artisan, relying on the teachings of these disclosures, would not be led to provide a lightguide utilizing internal reflection to illuminate a capillary array. For at least this reason, Applicants respectfully submit that claim 38 is not obvious over the combined teachings of Anazawa and Giallorenzi. Reconsideration and withdrawal of the rejection are respectfully requested.

IX. Allowable Subject Matter

Applicants wish to thank the Examiner for the indication that the subject matter of claims 4-5, 20-23, 25, 39 and 41 is allowable over the prior art of record.

In view of the above, Applicants respectfully submit that the claims are in condition for allowance. Reconsideration and withdrawal of the cited rejection are requested, and allowance of claims 1-45 at an early date is solicited. The date for response is extended from March 31, 2004 to April 30, 2004 by the attached Petition for a One Month Extension of Time under 37 C.F.R. § 1.136(a), and a check for the required petition fee of $110.00 under 37 C.F.R. 1.17(a)(1) is enclosed.

If questions remain regarding the above, please contact the undersigned.

Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: April 30, 2004

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